

## **WHAT IS CLAIMED IS:**

1. A method for generating a preamble sequence to decrease a peak-to-average power ratio (PAPR) through at least two antennas in an orthogonal frequency division multiplexing (OFDM) communication system including an inverse fast Fourier transform (IFFT) processor for IFFT-transforming an input preamble sequence for a plurality of subcarriers in a frequency domain and generating a preamble sequence corresponding to the subcarriers in a time domain, the method comprising the steps of:
  - 5 generating a first preamble sequence in which odd data of the preamble sequence becomes null data and even data of the preamble sequence becomes data, the first preamble sequence being adapted to be transmitted via one of the at least two antennas; and
  - 10 generating a second preamble sequence in which the even data of the preamble sequence becomes null data and the odd data of the preamble sequence becomes data, the second preamble sequence being adapted to be transmitted via another one of the at least two antennas.
  - 15

2. The method of claim 1, wherein the second preamble sequence is defined as Pg(-100:100), where:

20

3. The method of claim 1, wherein the first preamble sequence  $P(-100:100)$  is defined as  $P(-100:100)$ , where:

```

P(-100:100) = { -1, 0,+1, 0,+1, 0,+1, 0,-1, 0,+1, 0,-1, 0,+1, 0,
-1, 0,-1, 0,+1, 0,+1, 0,-1, 0,+1, 0,-1, 0,+1, 0,-1, 0,+1, 0,
-1, 0,+1, 0,+1, 0,-1, 0,+1, 0,-1, 0,+1, 0,-1, 0,-1, 0,
-1, 0,+1, 0,+1, 0,-1, 0,+1, 0,+1, 0,+1, 0,-1, 0,+1, 0,+1, 0,
-1, 0,-1, 0,-1, 0,+1, 0,+1, 0,+1, 0,+1, 0,+1, 0,+1, 0,+1, 0,
0, 0,
-1, 0,-1, 0,+1, 0,-1, 0,-1, 0,+1, 0,+1, 0,-1, 0,+1, 0,-1, 0,
+1, 0,+1, 0,-1, 0,-1, 0,-1, 0,-1, 0,+1, 0,-1, 0,-1, 0,
-1, 0,-1, 0,-1, 0,-1, 0,+1, 0,+1, 0,+1, 0,-1, 0,+1, 0,+1, 0,
-1, 0,+1, 0,+1, 0,-1, 0,+1, 0,+1, 0,+1, 0,-1, 0,-1, 0,-1, 0,
-1, 0,-1, 0,+1, 0,-1, 0,+1, 0,-1, 0,-1, 0,+1, 0,-1, 0,-1, 0
*sqrt(2)*sqrt(2)

```

4. A method for generating a preamble sequence to decrease a peak-to-average power ratio (PAPR) in an orthogonal frequency division multiplexing (OFDM) 5 communication system including an inverse fast Fourier transform (IFFT) processor for IFFT-transforming an input preamble sequence for a plurality of subcarriers in a frequency domain and generating a preamble sequence corresponding to the subcarriers in a time domain, the method comprising the steps of:

generating a first preamble sequence in which odd data of the preamble 10 sequence becomes null data and even data of the preamble sequence becomes data, for one OFDM symbol period; and

generating a second preamble sequence in which the even data of the preamble sequence becomes null data and the odd data of the preamble sequence becomes data, for a next OFDM symbol period after passage of the one OFDM symbol period.

15

5. The method of claim 4, wherein the second preamble sequence is defined as Pg(-100:100), where:

```

Pg(- 100:100)= { 0,- 1, 0,- 1, 0,+1, 0,- 1, 0,+1, 0,- 1, 0,+1, 0,- 1,
0,+1, 0,+1, 0,- 1, 0,+1, 0,- 1, 0,+1, 0,- 1, 0,+1, 0,+1,
0,+1, 0,+1, 0,- 1, 0,+1, 0,- 1, 0,+1, 0,- 1, 0,- 1, 0,+1, 0,+1,
0,- 1, 0,- 1, 0,+1, 0,- 1, 0,+1, 0,- 1, 0,+1, 0,+1, 0,- 1, 0,- 1,
0,- 1, 0,- 1, 0,+1, 0,+1, 0,+1, 0,+1, 0,+1, 0,- 1, 0,+1, 0,+1,
., - 1,
0,- 1, 0,+1, 0,- 1, 0,+1, 0,- 1, 0,+1, 0,+1, 0,- 1, 0,- 1, 0,- 1,
0,- 1, 0,+1, 0,+1, 0,+1, 0,+1, 0,+1, 0,- 1, 0,+1, 0,+1, 0,- 1,
0,- 1, 0,+1, 0,+1, 0,+1, 0,+1, 0,+1, 0,- 1, 0,+1, 0,+1, 0,- 1,
0,- 1, 0,+1, 0,+1, 0,+1, 0,+1, 0,+1, 0,- 1, 0,+1, 0,+1, 0,+1,
0,+1, 0,- 1, 0,- 1, 0,- 1, 0,- 1, 0,- 1, 0,+1, 0,- 1, 0,- 1, 0
*sqrt(2)*sqrt(2)

```

6. The method of claim 4, wherein the first preamble sequence is defined as  $P(-100:100)$ , where:

$$\begin{aligned}
 P(-100:100) = & \{ -1, 0,+1, 0,+1, 0,+1, 0,-1, 0,-1, 0,+1, 0,-1, 0,+1, 0, \\
 & -1, 0,-1, 0,+1, 0,+1, 0,-1, 0,+1, 0,-1, 0,+1, 0,-1, 0,+1, 0, \\
 & -1, 0,+1, 0,+1, 0,-1, 0,+1, 0,-1, 0,-1, 0,+1, 0,-1, 0,-1, 0, \\
 & -1, 0,+1, 0,+1, 0,-1, 0,+1, 0,+1, 0,-1, 0,+1, 0,-1, 0,+1, 0, \\
 & -1, 0,-1, 0,-1, 0,+1, 0,+1, 0,+1, 0,+1, 0,+1, 0,+1, 0,+1, 0, \\
 & 0, 0, \\
 & -1, 0,-1, 0,+1, 0,-1, 0,-1, 0,+1, 0,+1, 0,-1, 0,+1, 0, \\
 & +1, 0,+1, 0,-1, 0,-1, 0,-1, 0,-1, 0,-1, 0,+1, 0,-1, 0, \\
 & -1, 0,-1, 0,-1, 0,-1, 0,+1, 0,+1, 0,+1, 0,-1, 0,+1, 0, \\
 & -1, 0,+1, 0,+1, 0,-1, 0,+1, 0,+1, 0,-1, 0,-1, 0,-1, 0, \\
 & -1, 0,-1, 0,+1, 0,-1, 0,-1, 0,+1, 0,-1, 0,-1, 0,-1, 0, \\
 & *sqrt(2)*sqrt(2)
 \end{aligned}$$

5

7. A method for generating a preamble sequence to decrease a peak-to-average power ratio (PAPR) through two antennas in an orthogonal frequency division multiplexing (OFDM) communication system including an inverse fast Fourier transform (IFFT) processor for IFFT-transforming an input preamble sequence for a plurality of subcarriers in a frequency domain and generating a preamble sequence corresponding to the subcarriers in a time domain, the method comprising the steps of:

generating a first preamble sequence in which odd data of the preamble sequence becomes null data and even data of the preamble sequence becomes data, the first preamble sequence being adapted to be transmitted via the first of the two antennas for one OFDM symbol period, and generating a second preamble sequence in which the even data of the preamble sequence becomes null data and the odd data of the preamble sequence becomes data, the second preamble sequence being adapted to be transmitted via the second of the two antennas for the one OFDM symbol period; and

generating the first preamble sequence in which odd data of the preamble sequence becomes null data and even data of the preamble sequence becomes data, the first preamble sequence being adapted to be transmitted via the second of the two antennas for a next OFDM symbol period after passage of the one OFDM symbol period, and generating the second preamble sequence in which the even data of the preamble sequence becomes null data and the odd data of the preamble sequence

becomes data, the second preamble sequence being adapted to be transmitted via the first of the two antennas for the next OFDM symbol period.

8. The method of claim 7, wherein the second preamble sequence is  
5 defined as Pg(-100:100), where:

$$\begin{aligned}
 Pg(-100:100) = & \{ 0, -1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, -1, \\
 & 0, +1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, +1, \\
 & 0, +1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, +1, \\
 & 0, -1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, \\
 & 0, -1, 0, -1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, -1, 0, +1, \\
 & \dots, -1, \\
 & 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, -1, 0, -1, \\
 & 0, -1, 0, +1, 0, +1, 0, +1, 0, +1, 0, -1, 0, +1, 0, +1, 0, -1, \\
 & 0, -1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, -1, 0, +1, 0, +1, 0, -1, \\
 & 0, -1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, -1, 0, +1, 0, +1, 0, +1, \\
 & 0, +1, 0, -1, 0, -1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, -1, 0, \\
 & *sqrt(2)*sqrt(2)
 \end{aligned}$$

9. The method of claim 7, wherein the first preamble sequence is defined as P(-100:100), where:

$$\begin{aligned}
 P(-100:100) = & \{ -1, 0, +1, 0, +1, 0, +1, 0, -1, 0, -1, 0, +1, 0, -1, 0, +1, 0, \\
 & -1, 0, -1, 0, +1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, \\
 & -1, 0, +1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, -1, 0, \\
 & -1, 0, +1, 0, +1, 0, -1, 0, +1, 0, +1, 0, +1, 0, -1, 0, +1, 0, +1, 0, \\
 & -1, 0, -1, 0, -1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, \\
 & 0, 0, \\
 & -1, 0, -1, 0, +1, 0, -1, 0, -1, 0, +1, 0, +1, 0, +1, 0, -1, 0, +1, 0, \\
 & +1, 0, +1, 0, -1, 0, -1, 0, -1, 0, -1, 0, -1, 0, +1, 0, -1, 0, \\
 & -1, 0, -1, 0, -1, 0, -1, 0, -1, 0, +1, 0, +1, 0, +1, 0, -1, 0, +1, 0, \\
 & -1, 0, +1, 0, +1, 0, -1, 0, +1, 0, +1, 0, +1, 0, -1, 0, -1, 0, -1, 0, \\
 & -1, 0, -1, 0, +1, 0, -1, 0, -1, 0, +1, 0, -1, 0, -1, 0, +1, 0, -1, 0, \\
 & *sqrt(2)*sqrt(2)
 \end{aligned}$$

10

10. An apparatus for generating a preamble sequence to decrease a peak-to-average power ratio (PAPR) through at least two antennas in an orthogonal frequency division multiplexing (OFDM) communication system including an inverse fast Fourier  
15 transform (IFFT) processor for IFFT-transforming an input preamble sequence for a plurality of subcarriers in a frequency domain and generating a preamble sequence corresponding to the subcarriers in a time domain, the apparatus comprising:

a first antenna preamble sequence generator for generating a first preamble sequence in which odd data of the preamble sequence becomes null data and even data of the preamble sequence becomes data, the first preamble sequence being adapted to be transmitted via one of the at least two antennas; and

5 a second antenna preamble sequence generator for generating a second preamble sequence in which the even data of the preamble sequence becomes null data and the odd data of the preamble sequence becomes data, the second preamble sequence being adapted to be transmitted via another one of the at least two antennas.

10 11. The apparatus of claim 10, wherein the second preamble sequence is defined as Pg(-100:100), where:

$$\begin{aligned}
 Pg(-100:100) = & \{ 0, -1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, -1, \\
 & 0, +1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, +1, \\
 & 0, +1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, -1, 0, +1, 0, +1, \\
 & 0, -1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, -1, 0, +1, \\
 & 0, -1, 0, -1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, -1, 0, +1, 0, +1, \\
 & \dots, -1, \\
 & 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, +1, 0, -1, 0, -1, 0, -1, \\
 & 0, -1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, -1, 0, +1, 0, +1, 0, -1, \\
 & 0, -1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, -1, 0, +1, 0, +1, 0, -1, \\
 & 0, -1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, -1, 0, +1, 0, +1, 0, +1, \\
 & 0, +1, 0, -1, 0, -1, 0, -1, 0, -1, 0, -1, 0, -1, 0, -1, 0, -1, 0, -1, 0, \\
 & *sqrt(2)*sqrt(2)
 \end{aligned}$$

12. The apparatus of claim 10, wherein the first preamble sequence is 15 defined as P(-100:100), where:

$$\begin{aligned}
 P(-100:100) = & \{ -1, 0, +1, 0, +1, 0, +1, 0, -1, 0, -1, 0, +1, 0, -1, 0, +1, 0, \\
 & -1, 0, -1, 0, +1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, \\
 & -1, 0, +1, 0, +1, 0, -1, 0, +1, 0, -1, 0, -1, 0, +1, 0, -1, 0, -1, 0, \\
 & -1, 0, +1, 0, +1, 0, -1, 0, +1, 0, +1, 0, +1, 0, -1, 0, +1, 0, +1, 0, \\
 & -1, 0, -1, 0, -1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, \\
 & 0, 0, \\
 & -1, 0, -1, 0, +1, 0, -1, 0, -1, 0, +1, 0, +1, 0, +1, 0, -1, 0, +1, 0, \\
 & +1, 0, +1, 0, -1, 0, -1, 0, -1, 0, -1, 0, -1, 0, +1, 0, -1, 0, \\
 & -1, 0, -1, 0, -1, 0, -1, 0, +1, 0, +1, 0, +1, 0, -1, 0, +1, 0, \\
 & -1, 0, +1, 0, +1, 0, -1, 0, +1, 0, +1, 0, +1, 0, -1, 0, -1, 0, -1, 0, \\
 & -1, 0, -1, 0, +1, 0, -1, 0, -1, 0, +1, 0, -1, 0, -1, 0, +1, 0, -1, 0, \\
 & *sqrt(2)*sqrt(2)
 \end{aligned}$$

13. An apparatus for generating a preamble sequence to decrease a peak-to-average power ratio (PAPR) in an orthogonal frequency division multiplexing (OFDM) communication system including an inverse fast Fourier transform (IFFT) processor for IFFT-transforming an input preamble sequence for a plurality of 5 subcarriers in a frequency domain and generating a preamble sequence corresponding to the subcarriers in a time domain, the apparatus comprising:

a preamble sequence generator for generating a first preamble sequence in which odd data of the preamble sequence becomes null data and even data of the preamble sequence becomes data, for one OFDM symbol period, and generating a 10 second preamble sequence in which the even data of the preamble sequence becomes null data and the odd data of the preamble sequence becomes data, for a next OFDM symbol period after passage of the one OFDM symbol period.

14. The apparatus of claim 13, wherein the second preamble sequence is 15 defined as Pg(-100:100), where:

$$\begin{aligned}
 Pg(-100:100) = & \{ 0, -1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, -1, \\
 & 0, +1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, +1, 0, +1, \\
 & 0, +1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, -1, 0, +1, 0, +1, \\
 & 0, -1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, +1, 0, -1, 0, -1, \\
 & 0, -1, 0, -1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, -1, 0, +1, 0, +1, \\
 & 0, -1, 0, -1, 0, +1, 0, -1, 0, +1, 0, +1, 0, +1, 0, -1, 0, -1, 0, +1, \\
 & 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, +1, 0, -1, 0, -1, 0, -1, \\
 & 0, -1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, \\
 & 0, -1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, \\
 & 0, +1, 0, -1, 0, -1, 0, -1, 0, -1, 0, -1, 0, -1, 0, -1, 0, -1, 0, -1, 0 \} \\
 & *sqrt(2)*sqrt(2)
 \end{aligned}$$

15. The apparatus of claim 13, wherein the first preamble sequence is defined as P(-100:100), where:

```

P(-100:100) = { -1, 0,+1, 0,+1, 0,+1, 0,-1, 0,-1, 0,+1, 0,-1, 0,+1, 0,
-1, 0,-1, 0,+1, 0,+1, 0,-1, 0,+1, 0,-1, 0,+1, 0,-1, 0,+1, 0,
-1, 0,+1, 0,+1, 0,-1, 0,+1, 0,-1, 0,+1, 0,-1, 0,+1, 0,-1, 0,
-1, 0,+1, 0,+1, 0,-1, 0,+1, 0,+1, 0,-1, 0,+1, 0,+1, 0,+1, 0,
-1, 0,-1, 0,-1, 0,+1, 0,+1, 0,+1, 0,-1, 0,+1, 0,+1, 0,+1, 0,
0, 0,
-1, 0,-1, 0,+1, 0,-1, 0,-1, 0,+1, 0,+1, 0,-1, 0,+1, 0,-1, 0,+1, 0,
+1, 0,+1, 0,-1, 0,-1, 0,-1, 0,-1, 0,-1, 0,+1, 0,-1, 0,+1, 0,-1, 0,
-1, 0,-1, 0,-1, 0,-1, 0,+1, 0,+1, 0,+1, 0,-1, 0,+1, 0,+1, 0,
-1, 0,+1, 0,+1, 0,-1, 0,+1, 0,+1, 0,+1, 0,-1, 0,-1, 0,-1, 0,
-1, 0,-1, 0,+1, 0,-1, 0,-1, 0,+1, 0,-1, 0,-1, 0,+1, 0,-1, 0,-1 }
*sqrt(2)*sqrt(2)

```

16. An apparatus for generating a preamble sequence to decrease a peak-to-average power ratio (PAPR) through at least two antennas in an orthogonal frequency division multiplexing (OFDM) communication system including an inverse fast Fourier transform (IFFT) processor for IFFT-transforming an input preamble sequence for a plurality of subcarriers in a frequency domain and generating a preamble sequence corresponding to the subcarriers in a time domain, the apparatus comprising:

5 a first antenna preamble sequence generator for generating a first preamble sequence in which odd data of the preamble sequence becomes null data and even data of the preamble sequence becomes data, the first preamble sequence being adapted to be transmitted via the first of the two antennas for one OFDM symbol period, and the second of the two antennas for a next OFDM symbol period after passage of the one OFDM symbol period; and

10 a second antenna preamble sequence generator for generating a second preamble sequence in which the even data of the preamble sequence becomes null data and the odd data of the preamble sequence becomes data, the second preamble sequence being adapted to be transmitted via the second of the two antennas for one OFDM symbol period and the first of the two antennas for the next OFDM symbol period.

15

20

17. The apparatus of claim 16, wherein the second preamble sequence is defined as Pg(-100:100), where:

```

Pg(- 100:100)= { 0,- 1, 0,- 1, 0,+1, 0,- 1, 0,+1, 0,- 1, 0,+1, 0,- 1, 0,- 1,
                  0,+1, 0,+1, 0,- 1, 0,+1, 0,- 1, 0,- 1, 0,+1, 0,+1,
                  0,+1, 0,+1, 0,- 1, 0,+1, 0,- 1, 0,+1, 0,- 1, 0,+1,
                  0,- 1, 0,- 1, 0,+1, 0,- 1, 0,+1, 0,- 1, 0,+1, 0,- 1,
                  0,- 1, 0,- 1, 0,+1, 0,+1, 0,+1, 0,- 1, 0,+1, 0,+1,
                  , - 1,
                  0,- 1, 0,+1, 0,- 1, 0,+1, 0,- 1, 0,+1, 0,- 1, 0,- 1,
                  0,- 1, 0,+1, 0,+1, 0,+1, 0,+1, 0,- 1, 0,+1, 0,+1, 0,- 1,
                  0,- 1, 0,+1, 0,+1, 0,+1, 0,+1, 0,- 1, 0,+1, 0,+1, 0,- 1,
                  0,- 1, 0,+1, 0,+1, 0,+1, 0,+1, 0,- 1, 0,+1, 0,+1, 0,+1,
                  0,+1, 0,- 1, 0,- 1, 0,- 1, 0,- 1, 0,+1, 0,- 1, 0,- 1, 0}
                  *sqrt(2)*sqrt(2)

```

18. The apparatus of claim 16, wherein the first preamble sequence is defined as P(-100:100), where:

```

P(-100:100) = { -1, 0,+1, 0,+1, 0,+1, 0,-1, 0,-1, 0,+1, 0,-1, 0,+1, 0,
                  -1, 0,-1, 0,+1, 0,+1, 0,-1, 0,+1, 0,-1, 0,+1, 0,-1, 0,+1, 0,
                  -1, 0,+1, 0,+1, 0,-1, 0,+1, 0,-1, 0,-1, 0,+1, 0,-1, 0,-1, 0,
                  -1, 0,+1, 0,+1, 0,-1, 0,+1, 0,+1, 0,+1, 0,-1, 0,+1, 0,+1, 0,
                  -1, 0,-1, 0,-1, 0,+1, 0,+1, 0,+1, 0,+1, 0,+1, 0,+1, 0,+1, 0,
                  0, 0,
                  -1, 0,-1, 0,+1, 0,-1, 0,-1, 0,+1, 0,+1, 0,+1, 0,-1, 0,+1, 0,
                  +1, 0,+1, 0,-1, 0,-1, 0,-1, 0,-1, 0,-1, 0,+1, 0,-1, 0,
                  -1, 0,-1, 0,-1, 0,-1, 0,-1, 0,+1, 0,+1, 0,+1, 0,-1, 0,+1, 0,
                  -1, 0,+1, 0,+1, 0,-1, 0,+1, 0,+1, 0,+1, 0,-1, 0,-1, 0,-1, 0,
                  -1, 0,-1, 0,+1, 0,-1, 0,-1, 0,+1, 0,-1, 0,-1, 0,+1, 0,-1, 0}
                  *sqrt(2)*sqrt(2)

```